

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) ~~Tuneable~~ A tuneable laser apparatus comprising:
a tuneable laser; ₁
a thermal sensor; and
a controller, ~~characterised in that said controller controls at least one or a combination of the following variables: the currents, the voltages, a tuning section and a phase section~~ a tuning section, a phase section, a tuning section current, a tuning section voltage, a phase section current and a phase section voltage, and incorporates ~~means an adjusting device which adjust~~ adjusts any appropriate at least one or combination of the tuning section, the phase section, the tuning section current, the tuning section voltage, the phase section current and the phase section voltage ~~said variables taking into account~~ based on an output wavelength of the tuneable laser that depends the laser's output wavelength dependency on temperature and at least one of the tuning section current, the tuning section voltage, the phase section current and the phase section voltage ~~section currents/voltage, whereby the output wavelength may be is kept at the desired an operating value without any significant a substantial mode jump whatever regardless of the temperature of operation within the laser's an operative range of the tuneable laser.~~

2. (Currently Amended) ~~The tuneable laser apparatus~~ Apparatus according to claim 1, comprising no closed loop laser temperature control ~~means~~ device.

3. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 1, further comprising a low pass filter for removing rapidly changing signals in the at least one of the tuning section current, the tuning section voltage, the phase section current and the phase section voltage ~~control currents or voltages~~.

4. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 1, wherein the tuneable laser is a Distributed Bragg Reflector (DBR) tuneable laser diode.

5. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 1, wherein the tuneable laser is a Distributed Feed Back (DFB) tuneable laser diode.

6. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 1, wherein the tunable laser is a Sampled Grating Distributed Bragg Reflector (SG-DBR) tuneable laser diode and the controller includes a processor programmed to follow ~~the a~~ a tuneability mapping of at least two of the tuning section current, the tuning section voltage, the phase section current and the phase section voltage~~the two or more tuning section and/or phase section currents or voltages~~, and feeds control signals to at least one of the tuning section and the phase section ~~those sections suitable to~~ that give gives a the required wavelength.

7. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 1, wherein the tunable laser is a Super Structure Grating Distributed Bragg Reflector (SSG-DBR), tuneable laser diode and the controller includes a processor programmed to follow ~~the a~~ a tuneability mapping of at least two of the tuning section current, the tuning section voltage, the phase section current and the phase section voltage~~the two or more tuning section and/or phase section currents or voltages~~, and feeds control signals to at least one of the tuning section and the phase section ~~those sections suitable to~~ that give gives a the required wavelength.

8. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 1, wherein the laser is a vertical cavity filter laser and the controller includes a processor programmed to follow ~~the a~~ a tuneability mapping of at least two of the tuning section current, the tuning section voltage, the phase section current and the phase section voltage~~the two or more tuning section and/or phase sections currents or voltages~~, and feeds control signals to at least one of the tuning section and the phase section ~~those sections suitable to~~ that give gives a the required wavelength.

9. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 1, wherein the apparatus incorporates a coolerless system associated with an optical phase lock loop (OPLL) to provide a frequency referenced coolerless laser diode.

10. (Currently Amended) ~~Apparatus~~ The tunable laser apparatus according to claim 1, wherein the apparatus incorporates a coolerless system associated with an optical injection phase lock loop system (OIPLL) to provide a frequency referenced coolerless laser diode.

11. (Currently Amended) A tuneable laser apparatus comprising:

i) ~~—a tuneable laser comprising at least one or more sections, each said section being one of a tuning section, a phase section and a gain section; said, wherein the at least one of the tuning section, the phase section and the gain section one or more sections is operable for determining tuning characteristics of the tuneable laser according to a respective current or voltage applied thereto;~~

ii) ~~—a thermal sensor arranged to sense the a laser temperature of said tuneable laser; and~~

iii) ~~—a controller for maintaining the laser's output wavelength an output wavelength of the laser at a required operating value independent of the laser temperature,~~

wherein the controller is arranged to:

receive the laser temperature as an input value;

determine the respective current/ or voltage to be applied to said one or more sections ~~the at least one of the tuning section, the phase section and the gain section~~, based on the laser temperature and a predetermined trend ~~defining that is~~ a relation between the determined current/ or voltage and the laser temperature for the required output wavelength, wherein the relation is defined by longitudinal mode jump boundaries within a mapping of wavelength interdependence of the determined current or voltage, whereby the output wavelength of the laser is maintained at the required operating value without a substantial mode jump; and

change the respective current/ or voltage applied to said one or more sections ~~the at least one of the tuning section, the phase section and the gain section~~ accordingly to

maintain the ~~laser's~~ output wavelength of the tuneable laser at the required operating value without ~~any significant~~ a substantial mode jump.

12. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 11, wherein, for a specified output wavelength value, the controller is arranged to receive the laser temperature as ~~the~~ a sole variable input value.

13. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 11, wherein, for a required output wavelength value, ~~said the~~ relation is a function solely of temperature.

14. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 11, wherein ~~said the~~ predetermined trend is a quadratic relation.

15. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 11, wherein ~~said the~~ relation is defined by ~~the~~ longitudinal mode jump boundaries of a mapping of output wavelength with respect to the respective current/ or voltage applied to at least two of ~~said sections~~ the tuning section, the phase section and the gain section.

16. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 15, wherein ~~said the~~ relation is further defined by ~~the~~ a linear variation of output wavelength with temperature.

17. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 11, comprising no closed loop laser temperature control ~~means~~ device.

18. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 11, wherein the tuneable laser is a Distributed Bragg Reflector (DBR) tuneable laser diode.

19. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 11, wherein the tuneable laser is a Distributed Feed Back (DFB) tuneable laser diode.

20. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 11, wherein the tuneable laser is a Sampled Grating Distributed Bragg Reflector (SG-DBR) tuneable laser diode and the controller includes a processor programmed to follow ~~the a~~ tuneability mapping of the two or more tuning section and/or phase section currents or voltages at least two of the tuning section current, the tuning section voltage, the phase section current and the phase section voltage, and feeds control signals to the at least one of the tuning section, the phase section and the gain section ~~these sections suitable to that give the~~ gives a required wavelength.

21. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 11, wherein the tuneable laser is a Super Structure Grating Distributed Bragg Reflector (SSG-DBR), tuneable laser diode and the controller includes a processor programmed to follow ~~the a~~ tuneability mapping of at least two of the tuning section current, the tuning section voltage, the phase section current and the phase section voltage ~~the two or more tuning section and/or phase section currents or voltages, and feeds control signals to the at least one of the tuning section, the phase section and the gain section~~ these sections suitable to that give the gives a required wavelength.

22. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 11, wherein the tuneable laser is a vertical cavity filter laser and the controller includes a processor programmed to follow ~~the a~~ tuneability mapping of at least two of the tuning section current, the tuning section voltage, the phase section current and the phase section

~~voltage the two or more tuning section and/or phase sections currents or voltages, and feeds control signals to the at least one of the tuning section, the phase section and the gain section those sections suitable to that give the gives a required wavelength.~~

23. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 11, wherein the apparatus incorporates a coolerless system associated with an optical phase lock loop (OPLL) to provide a frequency referenced coolerless laser diode.

24. (Currently Amended) ~~Apparatus~~ The tuneable laser apparatus according to claim 11, wherein the apparatus incorporates a coolerless system associated with an optical injection phase lock loop system (OIPLL) to provide a frequency referenced coolerless laser diode.